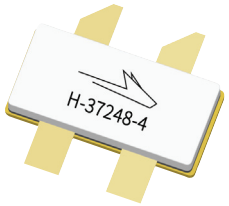
PTRA094252FC

Thermally-Enhanced High Power RF LDMOS FET
208 W, 48 V, 746 – 960 MHz

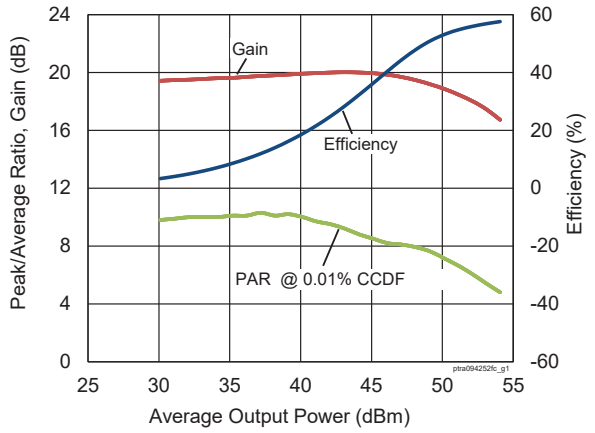
Description

The PTRA094252FC is a 208-watt LDMOS FET intended for use in multi-standard cellular power amplifier applications in the 746 to 960 MHz frequency band. Features include input matching, high gain and thermally-enhanced package with earless flanges. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.

PTRA094252FC
Package H-37248-4



Single-carrier WCDMA Drive-up
V_{DD} = 48 V, I_{DQ} = 550 mA, f = 875 MHz
3GPP WCDMA signal,
PAR = 10.0 dB, 3.84 MHz BW



Features

- Broadband internal input matching
- Asymmetrical Doherty design
  - Main : P_{1dB} = 190 W Typ
  - Peak : P_{1dB} = 250 W Typ
- Typical Pulsed CW performance, 875 MHz, 48 V, combined outputs
  - Output power at P_{1dB} = 208 W
  - Efficiency = 56%
  - Gain = 18.7 dB
- Capable of handling 10:1 VSWR @48 V, 208 W (CW) output power
- Integrated ESD protection
- Human Body Model Class 2 (per ANSI/ESDA/JEDEC JS-001)
- Low thermal resistance
- Pb-free and RoHS compliant

RF Characteristics

Single-carrier WCDMA Specifications (tested in Wolfspeed Doherty test fixture)
V_{DD} = 48 V, I_{DQ} = 550 mA, $V_{GS\ (Peak)}$ = (V_{GS} @ I_{DQ} = 770 mA) – 1.7 V, P_{OUT} = 89 W avg, f = 875 MHz, 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	17.5	18.5	—	dB
Drain Efficiency	η_D	46	48	—	%
Adjancent Channel Power Ratio	ACPR	—	–30.0	–28	dBc

All published data at T_{CASE} = 25°C unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

DC Characteristics (each side)

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_{DS} = 10 mA	$V_{(BR)DSS}$	110	—	—	V
Drain Leakage Current	V_{DS} = 50 V, V_{GS} = 0 V	I_{DSS}	—	—	1	µA
	V_{DS} = 105 V, V_{GS} = 0 V	I_{DSS}	—	—	10	µA
On-State Resistance (main)	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	0.07	—	Ω
(peak)	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	0.06	—	Ω
Operating Gate Voltage (main)	V_{DS} = 48 V, I_{DQ} = 550 mA	V_{GS}	3.5	3.6	3.7	V
(peak)	V_{DS} = 48 V, I_{DQ} = 0 A	V_{GS}	1.74	1.84	1.96	V
Gate Leakage Current	V_{GS} = 10 V, V_{DS} = 0 V	I_{GSS}	—	—	1	µA

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	110	V
Gate-Source Voltage	V_{GS}	–6 to +12	V
Operating Voltage	V_{DD}	0 to +55	V
Junction Temperature	T_J	225	°C
Storage Temperature Range	T_{STG}	–65 to +150	°C
Thermal Resistance (main, T_{CASE} = 85°C, 105 W 1C WCDMA)	$R_{\theta JC}$	0.45	°C/W
(peak, T_{CASE} = 85°C, 105 W 1C WCDMA)	$R_{\theta JC}$	0.12	°C/W

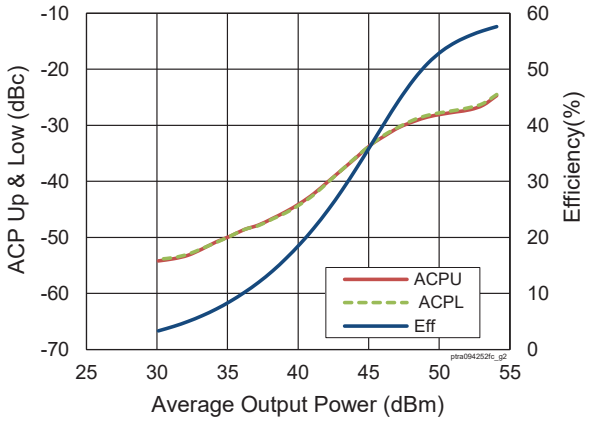
1. Operation above the maximum values listed here may cause permanent damage. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the component. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. For reliable continuous operation, the device should be operated within the operating voltage range (V_{DD}) specified above.
2. Parameters values can be affected by end application and product usage. Values may change over time.

Ordering Information

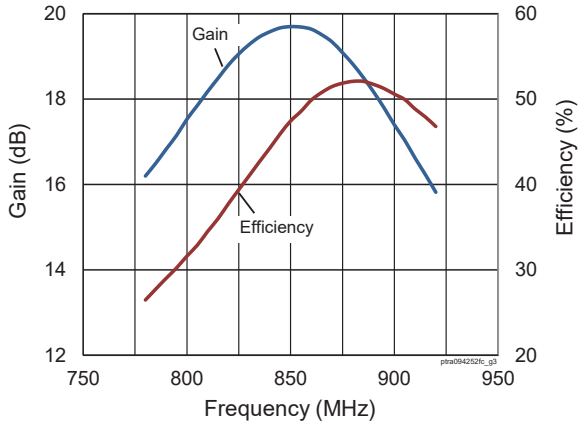
Type and Version	Order Code	Package Description	Shipping
PTRA094252FC V1 R0	PTRA094252FC-V1-R0	H-37248-4, earless flange	Tape & Reel, 50 pcs
PTRA094252FC V1 R2	PTRA094252FC-V1-R2	H-37248-4, earless flange	Tape & Reel, 250 pcs

Typical Performance (data taken in a production test fixture)

Single-carrier WCDMA Drive-up
V_{DD} = 48 V, I_{DQ} = 550 mA, f = 875 MHz,
3GPP WCDMA signal, PAR = 10 dB,
BW = 3.84 MHz



Single-carrier WCDMA Broadband Performance
V_{DD} = 48 V, I_{DQ} = 550 mA, P_{OUT} = 49.49 dBm,
3GPP WCDMA signal, PAR = 10 dB



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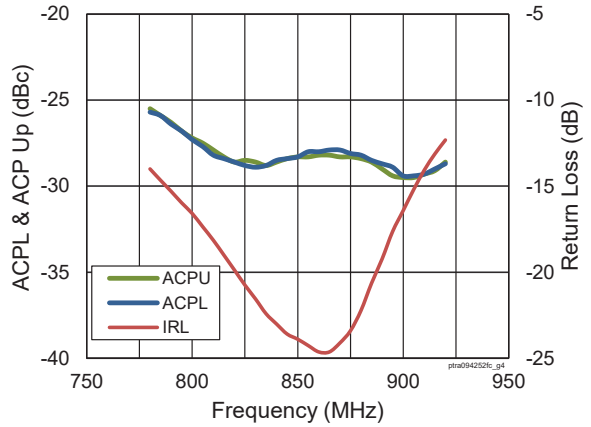
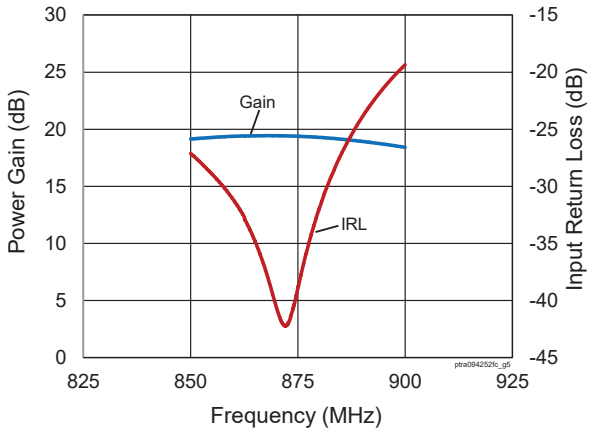


CW Performance Small Signal Gain & Input Return Loss
V_{DD} = 48 V, $I_{DQ(M)}$ = 550 mA, $V_{GS(PK)}$ = V_{GS} at I_{DQ} = 770mA-1.7 V



Load Pull Performance

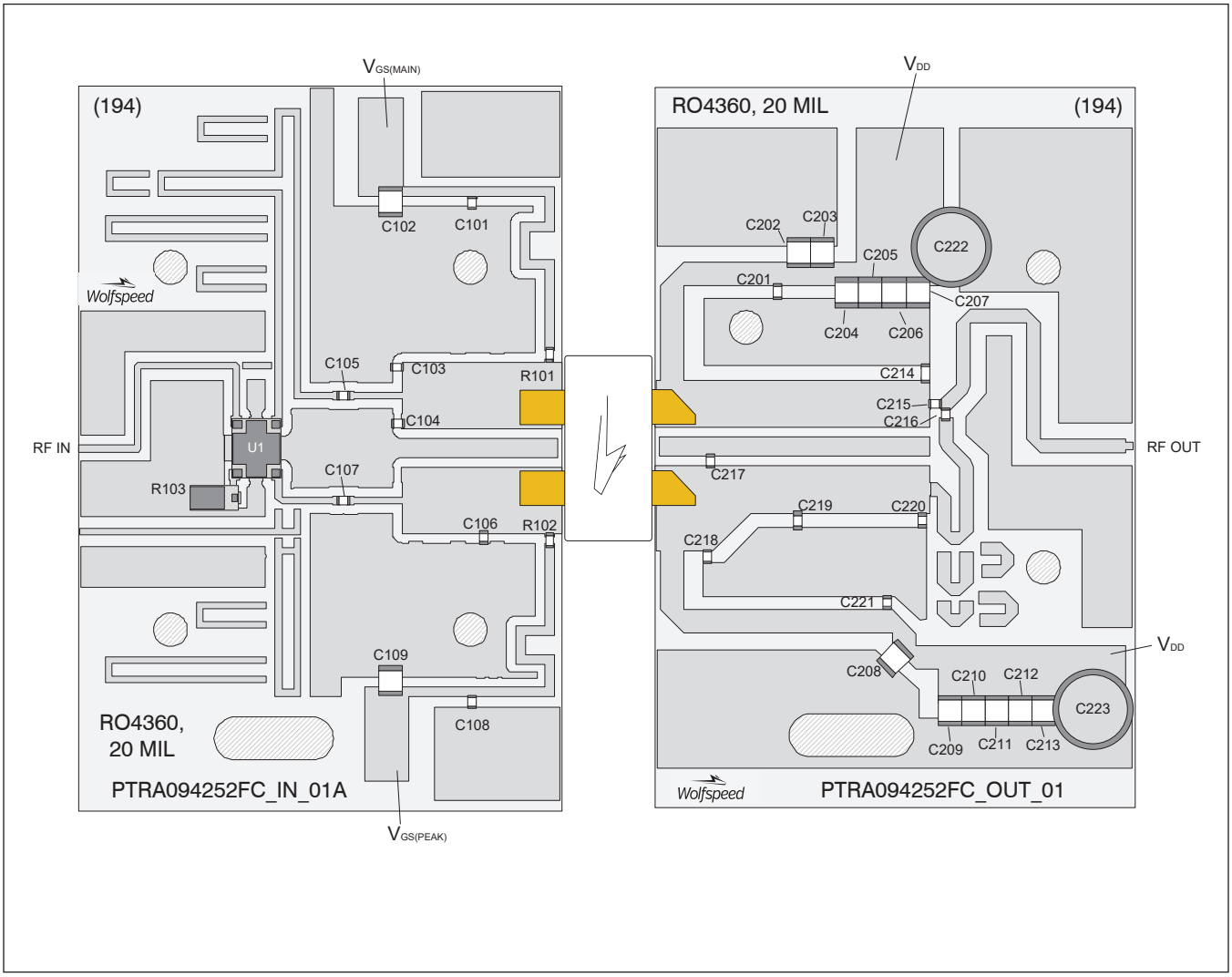
Main Side Load Pull Performance – Pulsed CW signal: 16 µs, 10% duty cycle, 48 V, I_{DQ} = 389 mA

		P_{1dB}									
		Max Output Power					Max PAE				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	PAE [%]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	PAE [%]
869	2.9 – j9	1.9 – j0.66	20.58	53.57	227.5	55	2.0 + j0.78	22.46	52.46	176.3	69.6
881	3.1 – j9.3	1.8 – j0.32	21.52	53.66	232.4	60.6	1.7 + j1.05	23.18	51.66	146.4	67.4
894	3.4 – j9.7	1.7 – j0.35	21.28	53.63	230.8	59.7	1.5 + j1.02	23	51.62	145.4	68.5

Peak Side Load Pull Performance – Pulsed CW signal: 16 µs, 10% duty cycle, 48 V, I_{DQ} = 516 mA

		P_{1dB}									
		Max Output Power					Max PAE				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	PAE [%]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	PAE [%]
869	2.6 – j9.7	1 – j1.2	19.88	55.59	362.2	53.8	1.21 – j0.16	21.86	53.55	226.4	67.5
881	2.9 – j10.4	1.4 – j1.7	19.95	55.47	352.1	53.6	1.17 – j0.2	22.06	53.61	229.6	67.2
894	3 – j10.6	1 – j1.3	19.84	55.46	351.5	54.2	0.95 – j0.28	21.81	53.59	228.8	68

Reference Circuit, 860 - 880 MHz



Reference circuit assembly diagram (not to scale)

Reference Circuit (cont.)

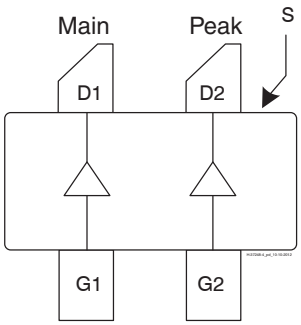
Reference Circuit Assembly

DUT	PTRA094252FC V1
Test Fixture Part No.	LTA/PTRA094252FC V1
PCB	Rogers 4360, 0.508 mm [0.020"] thick, 2 oz. copper, ε_r = 3.66, f = 860 – 880 MHz
Find Gerber files for this test fixture on the Wolfspeed Web site at www.wolfspeed.com/RF	

Components Information

Component	Description	Manufacturer	P/N
Input			
C101, C105, C107, C108	Capacitor, 43 pF	ATC	ATC600F430FW250T
C102, C109	Capacitor, 10 µF	Taiyo Yuden	UMK325C7106MM-T
C103	Capacitor, 4.3 pF	ATC	ATC600F4R3AW250T
C104	Capacitor, 1 pF	ATC	ATC600F1R0AW250T
C106	Capacitor, 4.7 pF	ATC	ATC600F4R7AW250T
R101, R102	Resistor, 10 ohms	Panasonic Electronic Components	ERJ-3GEYJ100V
R103	Resistor, 50 ohms	Richardson	C16A50Z4
U1	Hybrid coupler	Anaren	X3C09P1-04S
Output			
C201, C216, C221	Capacitor, 43 pF	ATC	ATC600F430FW250T
C202, C203, C204, C205, C206, C207, C208, C209, C210, C211, C212, C213	Capacitor, 10 µF	Taiyo Yuden	UMK325C7106MM-T
C214	Capacitor, 3.3 pF	ATC	ATC600F3R3AW250T
C215	Capacitor, 5.1 pF	ATC	ATC600F5R1AW250T
C217, C218	Capacitor, 12 pF	ATC	ATC600F120FW250T
C219	Capacitor, 6.8 pF	ATC	ATC600F6R8BW250T
C220	Capacitor, 0.6 pF	ATC	ATC600F0R6AW250T
C222, C223	Capacitor, 470 µF	Cornell Dubilier Electronics (CDE)	SEK471M050ST

Pinout Diagram (top view)



Pin	Description
D1	Drain device 1 (Main)
D2	Drain device 2 (Peak)
G1	Gate device 1 (Main)
G2	Gate device 2 (Peak)
S	Source (flange)

Lead connections for PTRA094252FC

Package Outline Specifications

Package H-37248-4

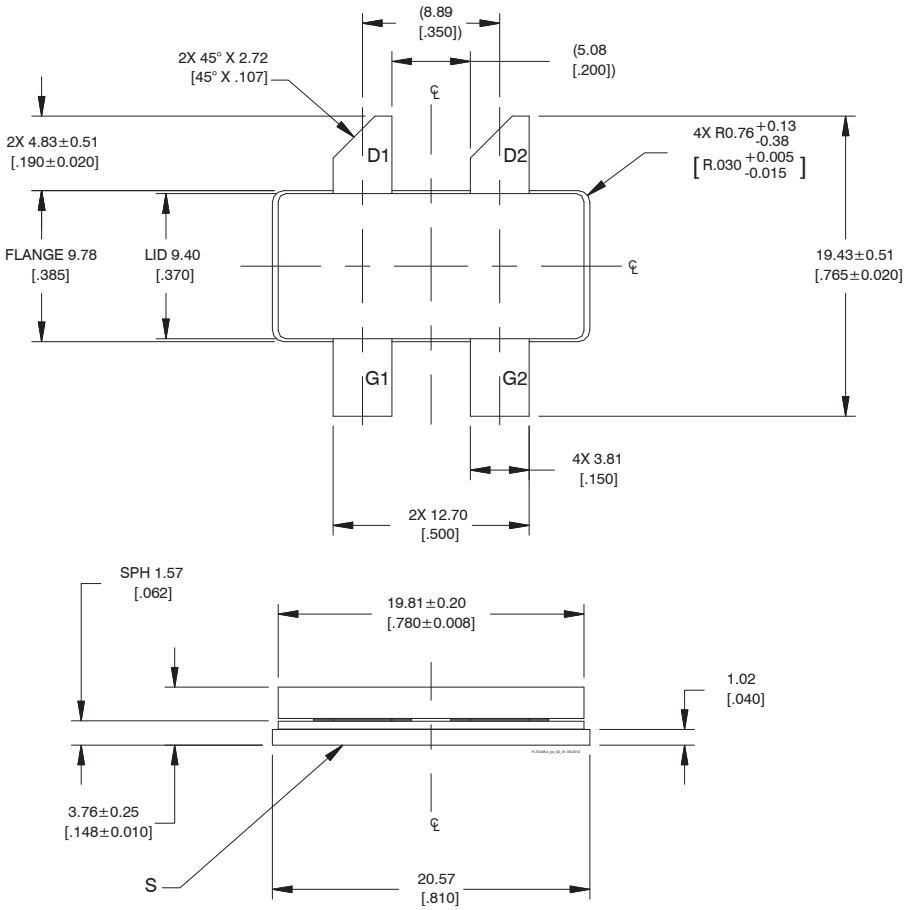


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ± 0.127 [.005] unless specified otherwise.
4. Pins: D1, D2 – drains; G1, G2 – gates; S – source.
5. Lead thickness: 0.10 + 0.076/–0.025 mm [0.004+0.003/–0.001 inch].
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

Revision History

Revision	Date	Data Sheet Type	Page	Subjects (major changes since last revision)
01	2015-07-09	Advance	All	Data Sheet reflects advance specification for product development
01.1	2015-12-13	Advance	2	Updated Maximum Ranging
02	2016-04-04	Production	All All	Data Sheet reflects released product specification Revised all data and includes updated final specs, typical performance graphs, loadpull, reference circuit, package outline
03	2016-06-02	Production	1, 3 5, 6	Revised graphs to 875Mhz Revised reference circuit and component list
04	2016-10-18	Production	1	Revised P1dB for main & peak and HBM classification
04.1	2017-02-01	Production	2	Updated operating voltage and junction temperature
04.2	2017-12-08	Production	2	Updated drain-source breakdown voltage and drain-source voltage. Adding notes to max ratings table
05	2018-06-22	Production	All	Converted to Wolfspeed Data Sheet

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Notes

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